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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER
LEE, SHUN K

ART UNIT	PAPER NUMBER
2878	

DATE MAILED: 06/18/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/534,204	IMAI ET AL.	
	Examiner	Art Unit	
	Shun Lee	2878	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *24 March 2003* .

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8,31-36 and 59-63* is/are pending in the application.

4a) Of the above claim(s) *32,33,35,36,60 and 61* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-8,31,34,59,62 and 63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☒ The proposed drawing correction filed on *10 October 2002* is: a)☒ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of species I (claims 1-8) in Paper No. 12 has been acknowledged.

2. Applicant has added claims 62 and 63. Claims 32, 33, 35, 36, 60, and 61 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected species, there being no allowable generic or linking claim. Election was made **without** traverse in Paper No. 12.

Drawings

3. The proposed drawing correction and/or the proposed substitute sheets of drawings, filed on 10 October 2002 have been approved. A proper drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The correction to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

5. Claim 63 is rejected under 35 U.S.C. 112, first paragraph, as containing subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claim 31 recites the limitation "projecting the recording light onto the stimulable phosphor sheet while applying an

electric field to the photoconductive material layer, and detecting charges generated in the photoconductive material layer when the recording light or the momentary light impinges upon the photoconductive material layer, thereby obtaining a preliminary read-out image signal bearing thereon image information". Newly added claim 63 which depends from claim 31 recites the limitation "wherein said electric field generates an avalanche effect". However, the specification as filed fails to disclose obtaining a preliminary read-out image signal by detecting charges generated in the photoconductive material layer when the recording light or the momentary light impinges upon the photoconductive material layer while applying an electric field which generates an avalanche effect to the photoconductive material layer.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

7. Claim 59 is rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential structural cooperative relationships of elements, such omission amounting to a gap between the necessary structural connections. See MPEP § 2172.01. The omitted structural cooperative relationships are: a voltage power source to other elements within the claims. It is noted that applicant argues that the voltage power source is the source of the electric field imparted to the photoconductive material. However this feature is not recited in the claims.

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1-4, 5-8, 59, and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van den Bogaert (Research Disclosure 34264, October 1992) in view of Tsuji *et al.* (US 5,196,702) and Takahashi *et al.* (US 5,059,794).

In regard to claims **5-7**, Van den Bogaert discloses (Fig.) an image read-out system comprising:

(a) a stimulating light source (left column, lines 39-43) which emits stimulating light (7) in a wavelength range of greater than 600 nm,

(b) a stimulating light scanning means (left column, lines 49-57) which causes the stimulating light (7) emitted from the stimulating light source to scan a stimulable phosphor sheet (1) having a layer of stimulable phosphor which emits stimulated emission in a wavelength range less than 500 nm (*i.e.*, 390 nm; right column, lines

13-17) in proportion to the stored energy of radiation upon exposure to the stimulating light (7),

(c) a solid image sensor (left column, lines 17-33) having a photoconductive material layer (3) the major component of which is a-Se (right column, lines 13-17) and which exhibits electric conductivity upon exposure to the stimulated emission from the stimulable phosphor sheet (1),

(d) an electric voltage imparting means (6) which imparts an electric voltage to the photoconductive material layer (3) of the solid image sensor to apply an electric field in the photoconductive material layer (3), and

(e) an image signal obtaining means (5, 8) which detects electric charges generated in the photoconductive material layer (3) of the solid image sensor when the stimulable phosphor sheet (1) is exposed to the stimulating light (7) and stimulated emission emitted from the stimulable phosphor sheet (1) impinges upon the photoconductive material layer (3) with an electric voltage imparted to the photoconductive material layer (3) by the electric voltage imparting means (6) to apply the electric field in the photoconductive material layer (3), and detects an image signal representing an image stored on the stimulable phosphor sheet (1).

The image read-out system of Van den Bogaert lacks that said photoconductive material layer of the solid image sensor is 1 μm to 100 μm (or 10 μm to 50 μm) in thickness and wherein the electric field generates an avalanche amplification effect. a-Se photoconductive material layer properties are well known in the art. For example, Tsuji *et al.* teach (column 24, lines 15-39) to provide a 0.1 μm to 500 μm a-Se

photoconductive material layer and to apply an electric field sufficient for avalanche amplification in order to enhance the quantum efficiency of the a-Se photoconductive material layer for "light". As another example, Takahashi *et al.* teach to provide an a-Se photoconductive material layer (*e.g.*, 2 μm thick; column 6, lines 15-39) and to apply an electric field to the a-Se photoconductive material layer sufficient for avalanche amplification in order to increase optical detection sensitivity (column 2, lines 18-22 and 47-58) wherein a laser stimulable phosphor can optionally be used as the storage portion (column 7, lines 26-40). Therefore it would have been obvious to one having ordinary skill in the art to apply a sufficient electric field to a 0.1 μm to 500 μm a-Se photoconductive material layer in the image read-out system of Van den Bogaert, in order to enhance optical detection sensitivity (*i.e.*, quantum efficiency) via avalanche amplification for the stimulated emission from the stimulable phosphor sheet.

In regard to claims **1-3** and **62**, the method steps are implicit for the modified apparatus of Van den Bogaert since the structure is the same as the applicant's apparatus of claims 5-7.

In regard to claim **4** (which is dependent on claim 1), and claim **8** (which is dependent on claim 5), and claim **59** (which is dependent on claim 8 in so far as understood), Van den Bogaert discloses (see above) that the image signal obtaining means detects an image signal (S) representing an image stored on the stimulable phosphor sheet by detecting electric charges (Q) generated in the photoconductive material layer by stimulated emission (L_E). Thus, relationships between S, Q, and L_E (*i.e.*, $S = g(Q)$, $Q = h(L_E)$, and $S = g(Q) = g(h(L_E)) = f(L_E)$) are inherent in detecting an

image signal (S) representing a stored image by detecting electric charges (Q) generated by stimulated emission (L_E). The image read-out system of Van den Bogaert lacks a fluctuation suppressing means that suppresses image signal fluctuations due to fluctuation in the electric field applied to the photoconductive material layer (e.g., by correcting the image signal according to applied electric field fluctuations from voltage power source fluctuations). Photoconductor quantum efficiency (η) as a function of applied electric field (E) is well known in the art. As examples, both Tsuji *et al.* (Fig. 10; column 22, lines 34-62) and Takahashi *et al.* (Fig. 3) teach that there is a steep increase in quantum efficiency (η) when the applied electric field (E) increases. In addition it is important to recognize (see for example Eq. 4 of Takahashi *et al.*) that quantum efficiency (η) denotes efficiency for conversion of light (L) into charge (Q). Thus Q is proportional to η which is a function of both L and E and $S = g(Q) = g(h_A(L_E,E)) = f_A(L_E,E)$. Therefore it would have been obvious to one having ordinary skill in the art to provide a fluctuation suppressing means (*e.g.*, $S = f_A(L_E,E)$) in the image read-out system of Van den Bogaert, so that the image signal (S) is indicative of the stimulated emission (L_E) and thus representative of the image stored on the stimulable phosphor sheet.

11. Claims 31 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Van den Bogaert (Research Disclosure 34264, October 1992) in view of Tsuji *et al.* (US 5,196,702), Takahashi *et al.* (US 5,059,794) and Hunter *et al.* (US 6,192,105).

In regard to claim **34**, Van den Bogaert in view of Tsuji *et al.* and Takahashi *et al.* is applied as in claim 5 above. Van den Bogaert also discloses (left column, lines 36-

39) a stimulable phosphor layer having a prompt emission (*i.e.*, momentary light emitted from the stimulable phosphor layer upon exposure to the recording light). Since the prompt emission and the photostimulated emission have the same wavelength range (see Van den Bogaert left column, lines 34-39), it is inherent that the photoconductive material layer exhibits electric conductivity upon exposure to either photostimulated or prompt emission from the stimulable phosphor layer. Further, it is well known in the art that photoconductive material layers exhibit electric conductivity upon exposure to recording light such as X-rays. For example, Tsuji *et al.* teach (column 24, lines 15-39) that a photoconductive material layer exhibits electric conductivity upon exposure to the recording light (*i.e.*, X-ray). The image read-out system of Van den Bogaert lacks a preliminary read-out image signal obtaining means which obtains a preliminary read-out image signal bearing thereon image information by detecting charges generated in the photoconductive material layer when the recording light or the momentary light impinges upon the photoconductive material layer. Hunter *et al.* teach (Fig. 7) to provide an automatic exposure control device comprising at least one photoconductor (*e.g.*, a-Se) detector in order to obtain the correct x-ray exposure (column 1, lines 13-23). Therefore it would have been obvious to one having ordinary skill in the art to use the image read-out system of Van den Bogaert as a preliminary read-out image signal obtaining means in order to obtain the correct x-ray exposure as taught by Hunter *et al.*

In regard to claim **31**, the method steps are implicit for the modified apparatus of Van den Bogaert since the structure is the same as the applicant's apparatus of claim 34.

Response to Arguments

12. Applicant's arguments filed 24 March 2003 have been fully considered but they are not persuasive.

In response to applicant's arguments (third paragraph on pg. 6 to last paragraph on pg. 8 of remarks filed 24 March 2003) against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). As discussed above, Van den Bogaert discloses an image signal obtaining means (5, 8) which detects electric charges generated in the photoconductive material layer (3) of the solid image sensor when the stimulable phosphor sheet (1) is exposed to the stimulating light (7) and stimulated emission emitted from the stimulable phosphor sheet (1) impinges upon the photoconductive material layer (3) with an electric voltage imparted to the photoconductive material layer (3) by the electric voltage imparting means (6) to apply the electric field in the photoconductive material layer (3), and detects an image signal representing an image stored on the stimulable phosphor sheet (1). It should be noted that Tsuji *et al.* (column 24, lines 15-39) and Takahashi *et al.* (column 2, lines 18-22 and 47-58) were cited as examples that photo-carrier avalanche amplification is one of the well known a-Se photoconductive material layer properties. It is important to recognized that Tsuji *et al.* state (column 1, lines 18-21) that "Incidentally, the "light" will be herein termed as an electromagnetic wave for generating electron-hole pairs acting as photo-carriers when it is incident upon a photoconductor". Further, Tsuji *et al.* provide (column

23, line 41 to column 24, line 39) as one example of the "light", emission from an activated alkali earth fluorohalide phosphor or alkalihalide phosphor such as $BaFCl:Eu^2$. Thus it is clear that any "light" such as emission from an activated alkali earth fluorohalide phosphor or alkalihalide phosphor which generates photo-carriers can be amplified via the avalanche effect to enhance the quantum efficiency of the a-Se photoconductive material layer for that "light". Therefore it would have been obvious to one having ordinary skill in the art to apply a sufficient electric field in the image read-out system of Van den Bogaert, in order to enhance the quantum efficiency of the a-Se photoconductive material layer for the light (*i.e.*, stimulated emission).

Applicant argues (second and third paragraphs on pg. 9 of remarks filed 24 March 2003) that other quantities could also be suppressed but fails to specify and explain how other quantities are suppressed. It is noted that applicant admits that Takahashi *et al.* teach a relationship between quantum efficiency and the applied electric field.

Applicant argues (last paragraph on pg. 9 of remarks filed 24 March 2003) that the references do not teach or suggest correcting the image signal according to the fluctuation of a voltage power source during read-out of the image signal as recited in the presently amended dependent claim 59. Examiner respectfully disagrees for the reasons stated in the grounds of rejection above.

Applicant argues (second and third paragraphs on pg. 10 of remarks filed 24 March 2003) that the combination references do not teach or suggest a preliminary read-out signal bearing image information thereon. Examiner respectfully disagrees. It

is clear that the image read-out system of Van den Bogaert provides a read-out signal bearing image information thereon. Hunter *et al.* teach (Fig. 7) to provide an automatic exposure control device comprising at least one photoconductor (*e.g.*, a-Se) detector in order to obtain the correct x-ray exposure (column 1, lines 13-23). As stated in the grounds of rejection above, it would therefore have been obvious to one having ordinary skill in the art to use the image read-out system of Van den Bogaert as a preliminary read-out image signal obtaining means in order to obtain the correct x-ray exposure as taught by Hunter *et al.*

Conclusion

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shun Lee whose telephone number is (703) 308-4860. The examiner can normally be reached on Tuesday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Porta can be reached on (703) 308-4852. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

SL
June 12, 2003

DAVID PORTA
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